Claims

What is claimed is:

5   1. A packet service scheduling unit, which establishes a data channel connection with one end of a cross-connecting unit in a digital communication system, for scheduling packet services from a data service access processing unit and a line unit which establish a data channel connection with the other end of the cross-connecting unit, comprising:

a de-mapping module, for receiving a virtual container or virtual container group from

10   the cross-connecting unit in the digital communication system, and to extract an encapsulated data stream from the virtual container or the virtual container group for completing separation of the encapsulated data stream therefrom;

a decapsulating module, for decapsulating the encapsulated data stream from the de-mapping module into one or more independent data frames;

15   a packet scheduling module, configured with multiple output ports and to receive the decapsulated data frame from the decapsulating module, read a label from the data frame, determine a corresponding output port based upon the label, and forward the data frame via the output port;

an encapsulating module, for receiving the decapsulated data frame forwarded by the

20   packet scheduling module and to encapsulate the data frame at the Data Link Layer; and

a mapping module, for receiving the encapsulated data frame and map the data frame to the virtual container or the virtual container group of the cross-connecting unit.

2. The packet service scheduling unit according to claim 1, further comprising a fault

25   alarming module for monitoring the packet service scheduling unit and report an abnormal status to the cross-connecting unit.

3. The packet service scheduling unit according to claim 1 or 2, wherein the mapping module and the de-mapping module are integrated into a mapping/de-mapping module, and the

encapsulating module and the decapsulating module are integrated into a encapsulating/decapsulating module.

4. The packet service scheduling unit according to claim 3, wherein a plurality of channels are provided between the encapsulating/decapsulating module and the mapping/de-mapping module and between the encapsulating/decapsulating module and the packet scheduling module.

5. The packet service scheduling unit according to claim 3, wherein the mapping/de-mapping module comprises a selection module, and a VC4 mapping/de-mapping and virtual concatenation processing circuit, a TU3 pointer processing circuit, a VC3 mapping/de-mapping and virtual concatenation processing circuit, a TU12 pointer processing circuit and a VC 12 mapping/de-mapping and virtual concatenation processing circuit connected sequentially, and the selection module is connected with the three virtual concatenation processing circuits to select one of the three so as to perform scheduling between the services of the virtual container or the virtual container group with different granularities.

6. The packet service scheduling unit according to claim 3, wherein the encapsulating/decapsulating module further comprises a GFP CID identifying module, and for a GFP frame from a different physical channel, finds a CID field in an extension head in the GFP frame, and forwards the GFP frame directly to a corresponding physical channel in accordance with a value of the CID field.

7. The packet service scheduling unit according to claim 3, wherein the encapsulating/decapsulating module comprises a first selection module, a second selection module and a plurality of protocol encapsulating/decapsulating circuits, wherein the first selection module is connected with the mapping/de-mapping module and selects one of the plurality of protocol encapsulating/decapsulating circuits, and the second selection module is connected with the packet scheduling module and selects one of the plurality of protocol

encapsulating/decapsulating circuits, and the three encapsulating/ decapsulating circuits are respectively corresponding to different physical channels and perform encapsulation/decapsulation for different protocols.

5   8. The packet service scheduling unit according to claim 7, wherein the plurality of protocol encapsulating/decapsulating circuits include a GFP encapsulating/decapsulating circuit, a LAPS encapsulating/decapsulating circuit and an HDLC encapsulating/ decapsulating circuit.

9. A packet service scheduling method using the packet service scheduling unit

10   according to claim 1 for a digital communication system comprising a line unit, a data service access processing unit and a cross-connecting unit, comprising:

configuring two service scheduling units with identical functions and configurations to be connected with the cross-connecting unit in the digital communication system;

copying, by the cross-connecting unit, services to be scheduled from the line unit and/or

15   the data service access processing unit to the service scheduling units which accordingly perform identical receipt, processing and transmission procedures for the services;

in case the service scheduling units both operate normally, receiving by the cross-connecting unit identical service streams from the service scheduling units, either of which is selected and cross-scheduled to the line unit and/or the data service access processing

20   unit in the digital communication system;

in case one of the service scheduling units fails, reporting by the failed service scheduling unit the fault to a control unit which instructs the cross-connecting unit to select the service stream from the other service scheduling unit which operates normally, or reporting the fault directly to the cross-connecting unit which selects the service stream from the

25   normally-operating one .

10. A packet service scheduling method using the packet service scheduling unit according to claim 1 for a digital communication system comprising a line unit, a data service

access processing unit and a cross-connecting unit, comprising:

configuring two service scheduling units with identical functions and configurations to be connected with the cross-connecting unit and the data service access processing unit in the digital communication system;

5   copying services to be scheduled by the cross-connecting unit and/or the data service access processing unit to the service scheduling units which accordingly perform identical receiving, processing and transmitting procedures for the services;

in case the service scheduling units both operate normally, receiving by the cross-connecting unit identical service streams from the service scheduling units, either of

10   which is selected and cross-scheduled to the line unit in the digital communication system, and receiving by the data service access processing unit the identical service streams from the service scheduling units, either of which is selected for processing; and

in case one of the service scheduling units fails, reporting by the failed service scheduling unit the fault to a control unit which instructs the cross-connecting unit and the data

15   service access processing unit to select the service stream from the normally-operating one, or reporting by the failed one the fault directly to the cross-connecting unit and the data service access processing unit which select the service stream from the normally-operating one.

11. A packet service scheduling method using the packet service scheduling unit

20   according to claim 1 for a digital communication system comprising a line unit, a data service access processing unit and a cross-connecting unit, comprising:

configuring two service scheduling units with identical functions and configurations to be connected with the cross-connecting unit in the digital communication system;

assigning, by the cross-connecting unit, services to be scheduled from the line unit

25   and/or the data service access processing unit to the service scheduling units;

in case the service scheduling units both operate normally, receiving by the cross-connecting unit service streams from the service scheduling units, which are cross-scheduled to the line unit and/or the data service access processing unit in the digital

communication system; and

in case one of the service scheduling units fails, reporting by the failed service scheduling unit the fault to a control unit which instructs the cross-connecting unit to switch a service originally assigned to the failed one to the normally-operating scheduling unit to

5   continue the service scheduling process, or reporting by the failed one the fault to the cross-connecting unit which switches a service originally assigned to the failed one to the normally-operating one to continue the service scheduling process.

12. A packet service scheduling method using the packet service scheduling unit

10   according to claim 1 for a digital communication system comprising a line unit, a data service access processing unit and a cross-connecting unit, comprising:

configuring two service scheduling units with identical functions and configurations to be connected with the cross-connecting unit and the data service access processing unit in the digital communication system;

15   ~   assigning, by the cross-connecting unit and/or the data service access processing unit, services to be scheduled to the service scheduling units;

in case the service scheduling units both operate normally, receiving by the cross-connecting unit service streams from the service scheduling units, one of which is selected and   cross-scheduled to the line unit in the system, and receiving by the data-service access

20   processing unit the identical service streams from the service scheduling units, one of which is selected for processing; and

in case one of the service scheduling units fails, reporting by the failed servicescheduling unit the fault to a control unit which instructs the cross-connecting unit to switch a service originally assigned to the failed one to the normally-operating one to continue the service

25   scheduling process, or reporting by the failed one the fault to the cross-connecting unit which switches a service originally assigned to the failed one to the normally-operating one to continue the service scheduling process.

13. The packet service scheduling method according to claim 12, wherein the services assigned to the service scheduling units have priorities, and a service with a low priority being processed is replaced by a service with a high priority during the service switching in case a service scheduling unit fails.

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